



## DISCUSSION

### Deep Canyon - Trend Study No. 30-35

#### Study Information

This study is located on fawn rearing habitat in the Deep Creek drainage on the south side of Grass Valley [elevation: 7,500 feet (2,286 m), slope: 50%-65%, aspect: north). There is ample vegetation for browsing, escape, and thermal cover. A small stream is located approximately a quarter mile away at the base of the hill. The study area is mixed mountain brush which is predominantly mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*) and curleaf mountain mahogany (*Cercocarpus ledifolius*). The study is located on the USFS Pine Valley allotment and is grazed from July 15-October 15, although livestock do not appear to be using the steeper slopes. Pellet group data estimated deer use to be moderately heavy in 1998 and 2008 (both years estimated at 40 deer days use/acre:99 ddu/ha), and very heavy in 2003 (75 ddu/acre:185 ddu/ha). Cattle use has been estimated to be very light in all three sample years (3 to 4 cow days use/acre:7 to 10 cdu/ha). This area would normally be considered summer range except during mild years when spring and fall use may also occur.

#### Soils

Soils are shallow in places and rocky on the surface and throughout the profile. There is some exposed bedrock. Soil depth is variable, but moderately deep overall with an estimated effective rooting depth of almost 16 inches. Texture is a sandy loam which is moderately acidic (pH 5.8). Soil movement is apparent, causing considerable pedestalling on the uphill side of shrubs and trees. Wildlife and livestock also trail across the slope causing substantial terracing. Ground cover is patchy with abundant rock and pavement cover. Relative combined vegetation and litter cover was 32% in 1998, and increased to 58% in 2003 and 2008. Relative combined rock and pavement cover has ranged from 26%-29% from 1998 to 2008. The high rock cover tends to accelerate runoff, and herbaceous vegetation cover is not sufficient to hold the soil. The erosion condition class was determined to be slight in 2003 and 2008 due to flow patterns on game trails and surface litter, surface rock, and soil movement.

#### Browse

Browse composition is divided among several species. The taller growth forms include pinyon pine (*Pinus edulis*), curleaf mountain mahogany, and a few mature Gambel oak (*Quercus gambelii*). Lower growing, more available browse plants include mountain big sagebrush, slenderbush eriogonum (*Eriogonum microthecum*), mountain snowberry (*Symphoricarpos oreophilus*), young curleaf mahogany, young Gambel oak, and Utah serviceberry (*Amelanchier utahensis*). Curleaf mountain mahogany provided 35% of the browse cover in 1998, 22% in 2003, and 23% in 2008. They numbered 420 plants/acre in 1998, increasing to 580 plants/acre in 2003, and decreasing to 440 plants/acre in 2008. Most plants are at least partly available to browsing while some are tree-like and unavailable due to height. Overhead canopy cover averaged about 30% in 1998, 2003, and 2008. Use of the available curleaf mahogany has been moderate to heavy with the heaviest use reported in 1992. Vigor remains normal and decadence low. Seedling and young recruitment has been good during all readings.

The primary understory shrubs include mountain big sagebrush, slenderbush eriogonum, and snowberry. Sagebrush provided 31% of the browse cover in 1998, increasing to 53% in 2003, and decreasing to 43% in 2008. The sagebrush population has increased steadily with each reading from 1,266 plants/acre in 1982 to 4,920 by 2008. Use has been mostly light, vigor good, and decadence low. Slenderbush eriogonum and snowberry appear to have stable populations displaying light to moderate use, good vigor, and low decadence. Other preferred shrubs that occur in small numbers include Utah serviceberry and antelope bitterbrush (*Purshia tridentata*).

### Herbaceous Understory

The herbaceous understory is moderately abundant, yet provides irregular ground cover. Perennial grasses are diverse with mutton bluegrass (*Poa fendleriana*) and Letterman needlegrass (*Stipa lettermani*) combining to produce 76% of the grass cover in 1998 and 78% in 2003. In 2008, mutton bluegrass produced 70% of the grass cover and Letterman needlegrass produced only 3%. Blue grama (*Bouteloua gracilis*), bottlebrush squirreltail (*Sitanion hystrix*), and subalpine needlegrass (*Stipa columbiana*) are also fairly abundant.

Forbs are abundant and diverse and produce as much cover as the grasses. However, composition could be better as annuals like blue-eyed Mary (*Collinsia parviflora*) and slender phlox (*Microsteris gracilis*) dominate and account for much of the forb cover. The most common perennial forbs include Eaton fleabane (*Erigeron eatonii*), redroot eriogonum (*Eriogonum racemosum*), Bonneville pea (*Lathyrus brachycalyx*), and desert phlox (*Phlox austromontana*).

### 1992 TREND ASSESSMENT

Trend for browse is up slightly. The density of the primary browse species', mountain big sagebrush and curleaf mountain mahogany, both increased. Vigor was good and decadence was low for both species. Data in 1982 for the herbaceous understory is limited to species quadrat frequencies. With this in mind, the trend for grasses is slightly up with increases in quadrat frequency of most species. The trend for forbs is stable. Forb quadrat frequencies stayed fairly stable with only a few select forbs increasing.

browse - slightly up (+1)

grass - slightly up (+1)

forb - stable (0)

### 1998 TREND ASSESSMENT

Trend for browse is stable. Differences in density of browse species may be related to the larger sample area used in 1998; therefore, trend for browse was determined using other parameters. Mountain big sagebrush vigor is good and decadence is low. Trend for the grasses is stable. There was little change in the sum of nested frequency for perennial grasses, though there was a significant decline in the nested frequency of mutton bluegrass. Trend for forbs is slightly down. Sum of nested frequency for perennial forbs has declined by 25% from 1992, with several forbs abundant in 1992 declining significantly in frequency.

browse - stable (0)

grass - stable (0)

forb - slightly down (-1)

### 2003 TREND ASSESSMENT

Trend for browse is up for the key species, curleaf mountain mahogany and mountain big sagebrush. Mahogany has increased in density by 28% from 1998. Mahogany vigor remains good and no decadent plants were sampled. Mountain big sagebrush provides most of the understory shrub cover. It has increased 25% in density from 1998 to 4,660 plants/acre. Sagebrush vigor remains good and decadence is low. Due to the high elevation, aspect, and importance of this area as fawning habitat, shrubs are not the most important vegetational aspect. The herbaceous understory, especially forbs is much more important for deer in the early spring. The herbaceous understory on this site is fairly abundant but patchy in its distribution. The trend for grasses is down. The sum of nested frequency of perennial grasses declined by 28% from 1998, and cover decreased from 11% in 1998 to 5%. There was a significant decrease in the nested frequency of bottlebrush squirreltail and letterman needlegrass. Trend for forbs is stable. There was little change in the sum of nested frequency of perennial forbs, though cover of perennial forbs declined slightly from 6% in 1998 to 4%.

browse - up (+2)

grass - down (-2)

forb - stable (0)

### 2008 TREND ASSESSMENT

Trend for browse is stable. Density of mountain big sagebrush increased slightly to 4,920 plants/acre. Sagebrush vigor is good and decadence remains low. Curleaf mahogany density declined slightly to 440 plants/acre. Mahogany vigor remained good and decadence low. Trend for both grasses and forbs is up. Sum

of nested frequency of perennial grasses has increased by 25% from 2003, and perennial grass cover increased from 5% in 2003 to 11%. Nested frequency of mutton bluegrass increased significantly. Sum of nested frequency of perennial forbs increased by 50% from 2003, and cover increased from 4% in 2003 to 6%.

browse - stable (0)

grass - up (+2)

forb - up (+2)

HERBACEOUS TRENDS --

Management unit 30 , Study no: 35

T y p e	Species					Average Cover %		
		'92	'98	'03	'08	'98	'03	'08
G	Agropyron trachycaulum	a5	a2	a-	b24	.18	-	.25
G	Bouteloua gracilis	14	11	10	13	.83	.04	.60
G	Bromus tectorum (a)	-	8	9	-	.01	.04	-
G	Carex sp.	3	-	-	3	-	-	.01
G	Koeleria cristata	-	4	-	-	.15	-	-
G	Poa fendleriana	b217	a152	a118	b211	3.85	2.59	7.96
G	Poa pratensis	a-	a-	b10	a-	.03	.08	-
G	Poa secunda	a-	c34	ab8	bc11	.45	.04	.22
G	Sitanion hystrix	b89	b76	a37	ab62	.71	.28	.73
G	Stipa columbiana	a8	a9	a12	b42	.24	.11	1.22
G	Stipa comata	a5	a-	b44	a-	-	.45	-
G	Stipa lettermani	c137	c141	b69	a18	4.42	1.23	.29
Total for Annual Grasses		0	8	9	0	0.01	0.04	0
Total for Perennial Grasses		478	429	308	384	10.88	4.84	11.30
Total for Grasses		478	437	317	384	10.90	4.89	11.30
F	Agoseris glauca	-	a18	b28	bc48	c.06	.19	.38
F	Antennaria rosea	a10	ab14	b25	a6	.60	.49	.21
F	Arabis sp.	ab9	ab12	a2	b22	.02	.03	.05
F	Astragalus argophyllus	b13	a-	a-	a-	-	-	-
F	Astragalus concordius	-	-	-	7	-	-	.18
F	Aster sp.	a-	a-	a1	b17	-	.00	.12
F	Astragalus sp.	7	2	1	-	.30	.00	-
F	Balsamorhiza sagittata	-	3	7	1	.15	.08	.03
F	Calochortus nuttallii	a-	a1	b14	ab7	.00	.05	.01
F	Chenopodium fremontii (a)	-	-	2	3	-	.01	.03
F	Comandra pallida	-	-	2	-	-	.00	-
F	Collinsia parviflora (a)	-	a152	b211	a187	2.54	3.04	.79
F	Crepis acuminata	a-	b25	a4	a5	.15	.07	.06
F	Delphinium nuttallianum	a-	a-	b17	b23	-	.07	.06
F	Epilobium brachycarpum (a)	-	8	-	3	.02	-	.01

T y p e	Species					Average Cover %		
		'92	'98	'03	'08	'98	'03	'08
F	<i>Erigeron eatonii</i>	<sub>b</sub> 91	<sub>b</sub> 82	<sub>a</sub> 41	<sub>a</sub> 42	1.14	.31	.38
F	<i>Eriogonum racemosum</i>	<sub>b</sub> 70	<sub>a</sub> 19	<sub>a</sub> 13	<sub>a</sub> 30	.10	.16	.16
F	<i>Eriogonum umbellatum</i>	<sub>a</sub> -	<sub>ab</sub> 4	<sub>ab</sub> 4	<sub>b</sub> 9	.03	.03	.08
F	<i>Fritillaria atropurpurea</i>	-	-	9	1	-	.04	.00
F	<i>Galium</i> sp.	-	8	2	-	.07	.00	-
F	<i>Hackelia patens</i>	<sub>b</sub> 56	<sub>a</sub> 18	<sub>ab</sub> 36	<sub>c</sub> 96	.37	.54	2.37
F	<i>Heuchera parvifolia</i>	2	-	-	6	-	-	.05
F	<i>Lathyrus brachycalyx</i>	<sub>b</sub> 60	<sub>a</sub> 21	<sub>a</sub> 13	<sub>a</sub> 14	.45	.10	.06
F	<i>Lappula occidentalis</i> (a)	-	<sub>b</sub> 29	<sub>a</sub> -	<sub>a</sub> 1	.41	-	.00
F	<i>Lithospermum ruderales</i>	-	-	-	-	-	-	.00
F	<i>Lithophragma tenella</i>	<sub>a</sub> -	<sub>a</sub> -	<sub>b</sub> 25	<sub>c</sub> 60	-	.14	.42
F	<i>Lomatium</i> sp.	<sub>a</sub> -	<sub>a</sub> 4	<sub>b</sub> 32	<sub>b</sub> 37	.01	.35	.41
F	<i>Lupinus argenteus</i>	<sub>c</sub> 23	<sub>bc</sub> 19	<sub>ab</sub> 5	<sub>a</sub> 3	.55	.21	.06
F	<i>Machaeranthera canescens</i>	<sub>b</sub> 8	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	.01	-	-
F	<i>Microsteris gracilis</i> (a)	-	<sub>b</sub> 95	<sub>a</sub> 1	<sub>a</sub> 3	1.41	.00	.00
F	<i>Pedicularis centranthera</i>	3	-	-	-	-	-	-
F	<i>Petroradia pumila</i>	<sub>ab</sub> 9	<sub>b</sub> 18	<sub>a</sub> 4	<sub>a</sub> 4	.71	.02	.07
F	<i>Phlox austromontana</i>	79	63	45	54	1.04	.71	.86
F	<i>Polygonum douglasii</i> (a)	<sub>a</sub> -	<sub>c</sub> 38	<sub>b</sub> 7	<sub>ab</sub> 6	.08	.05	.02
F	<i>Senecio multilobatus</i>	3	-	3	2	-	.01	.00
F	<i>Silene douglasii</i>	<sub>b</sub> 8	<sub>a</sub> -	<sub>a</sub> -	<sub>a</sub> -	-	-	-
F	<i>Taraxacum officinale</i>	14	18	4	10	.13	.03	.10
F	<i>Zigadenus paniculatus</i>	-	-	-	-	-	.00	-
Total for Annual Forbs		0	322	221	203	4.47	3.10	0.85
Total for Perennial Forbs		465	349	337	504	5.96	3.71	6.18
Total for Forbs		465	671	558	707	10.44	6.82	7.04

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --

Management unit 30 , Study no: 35

Type	Species	Strip Frequency			Average Cover %		
		'98	'03	'08	'98	'03	'08
B	Abies concolor	2	4	7	.00	.00	.76
B	Amelanchier utahensis	4	1	4	.00	.15	.15
B	Artemisia tridentata vaseyana	75	79	82	6.40	11.10	6.72
B	Cercocarpus ledifolius	18	15	14	7.19	4.61	3.55
B	Cercocarpus montanus	0	0	1	-	-	.00
B	Chrysothamnus parryi	3	1	3	.00	.00	.00
B	Eriogonum microthecum	75	51	71	4.66	1.89	2.75
B	Mahonia repens	2	4	4	.15	.04	.30
B	Opuntia sp.	11	13	9	.01	.06	.03
B	Pachistima myrsinites	4	15	0	.00	.90	-
B	Pinus edulis	4	2	4	.15	.38	.00
B	Purshia tridentata	3	0	0	.00	-	-
B	Quercus gambelii	7	2	2	.03	.18	.00
B	Symphoricarpos oreophilus	30	25	27	2.00	1.80	1.37
Total for Browse		238	212	228	20.61	21.14	15.67

CANOPY COVER, LINE INTERCEPT --

Management unit 30 , Study no: 35

Species	Percent Cover		
	'98	'03	'08
Abies concolor	-	.68	1.41
Amelanchier utahensis	-	6.73	.05
Artemisia tridentata vaseyana	-	8.69	10.00
Cercocarpus ledifolius	30.00	28.79	33.09
Chrysothamnus parryi	-	-	.15
Eriogonum microthecum	-	1.85	5.41
Mahonia repens	-	-	.21
Opuntia sp.	-	.26	.23
Pachistima myrsinites	-	.63	-
Pinus edulis	1.20	.76	2.00
Quercus gambelii	-	.08	-
Symphoricarpos oreophilus	-	1.39	3.31

KEY BROWSE ANNUAL LEADER GROWTH --

Management unit 30 , Study no: 35

Species	Average leader growth (in)	
	'03	'08
Artemisia tridentata vaseyana	1.7	1.5

POINT-QUARTER TREE DATA --

Management unit 30 , Study no: 35

Species	Trees per Acre		Average diameter (in)	
	'03	'08	'03	'08
Cercocarpus ledifolius	117	107	6.5	8.1

BASIC COVER --

Management unit 30 , Study no: 35

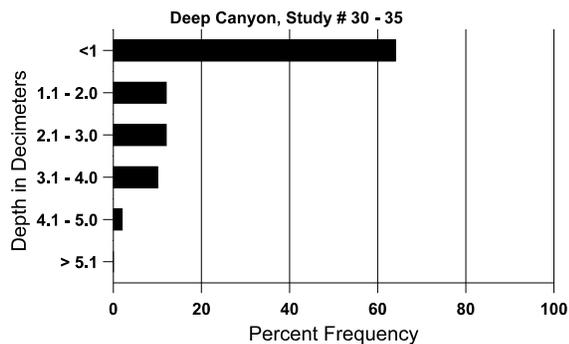
Cover Type	Average Cover %				
	'82	'92	'98	'03	'08
Vegetation	3.75	7.75	36.31	33.45	33.51
Rock	9.00	12.25	23.92	22.54	20.59
Pavement	1.50	17.00	11.67	7.75	12.37
Litter	44.50	46.00	31.70	33.90	34.54
Cryptogams	.25	.50	.47	.10	.16
Bare Ground	41.00	16.50	20.27	18.53	15.23

SOIL ANALYSIS DATA --

Management unit 30, Study no: 35, Study Name: Deep Canyon

Effective rooting depth (in)	Temp °F (depth)	pH	sandy loam			%OM	PPM P	PPM K	ds/m
			%sand	%silt	%clay				
15.5	51.4 (16.5)	5.8	68.0	17.4	14.6	3.4	12.1	163.2	0.5

Stoniness Index



PELLET GROUP DATA --

Management unit 30 , Study no: 35

Type	Quadrat Frequency		
	'98	'03	'08
Sheep	1	-	-
Rabbit	1	5	13
Deer	26	23	36
Cattle	4	1	1

Days use per acre (ha)		
'98	'03	'08
-	-	-
-	-	-
40 (99)	75 (185)	40 (99)
2 (5)	4 (11)	4 (9)

BROWSE CHARACTERISTICS --

Management unit 30 , Study no: 35

		Age class distribution (plants per acre)					Utilization						
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)	
<b>Abies concolor</b>													
82	<b>0</b>	-	-	-	-	-	0	0	-	-	0	-/-	
92	<b>66</b>	-	66	-	-	-	0	0	-	-	0	-/-	
98	<b>60</b>	-	60	-	-	-	0	0	-	-	0	-/-	
03	<b>80</b>	40	60	20	-	-	0	0	-	-	0	-/-	
08	<b>160</b>	20	120	40	-	-	0	0	-	-	0	-/-	
<b>Amelanchier utahensis</b>													
82	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-	
92	<b>0</b>	-	-	-	-	-	0	0	0	-	0	-/-	
98	<b>100</b>	-	40	40	20	-	20	20	20	20	20	26/21	
03	<b>20</b>	-	-	20	-	-	0	100	0	-	0	14/17	
08	<b>100</b>	-	20	60	20	-	0	80	20	-	0	3/14	
<b>Artemisia tridentata vaseyana</b>													
82	<b>1265</b>	-	333	599	333	-	0	0	26	-	0	19/27	
92	<b>2664</b>	1066	1266	999	399	-	18	3	15	-	8	20/26	
98	<b>3500</b>	780	840	2340	320	220	7	1	9	.57	4	22/30	
03	<b>4660</b>	260	1620	2520	520	360	0	0	11	3	3	16/30	
08	<b>4920</b>	1400	1580	2320	1020	680	19	2	21	9	12	12/23	
<b>Cercocarpus ledifolius</b>													
82	<b>865</b>	-	199	666	-	-	31	0	0	-	0	40/42	
92	<b>1199</b>	599	333	733	133	-	11	56	11	-	0	57/35	
98	<b>420</b>	200	100	300	20	20	24	10	5	-	0	102/101	
03	<b>580</b>	100	180	400	-	20	14	31	0	-	0	78/66	
08	<b>440</b>	100	140	260	40	60	5	45	9	5	5	43/35	

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Cercocarpus montanus</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	20	-	20	-	-	-	0	100	-	-	100	-/-
<b>Chrysothamnus parryi</b>												
82	66	-	-	66	-	-	0	0	0	-	0	21/22
92	66	-	66	-	-	-	0	100	0	-	0	-/-
98	100	-	20	80	-	-	20	0	0	-	0	6/7
03	100	-	-	100	-	-	0	100	0	-	0	5/7
08	80	-	-	60	20	-	50	25	25	25	25	6/8
<b>Eriogonum microthecum</b>												
82	2266	-	-	2266	-	-	9	0	0	-	0	9/18
92	6198	-	1866	4266	66	-	41	3	1	-	2	7/8
98	4920	60	660	4240	20	40	16	0	0	-	0	7/12
03	3560	20	220	3240	100	120	0	0	3	.56	.56	5/10
08	5760	940	1240	4220	300	40	15	5	5	1	1	8/15
<b>Gutierrezia sarothrae</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	0	-	-	-	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	6/5
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Mahonia repens</b>												
82	0	-	-	-	-	-	0	0	0	-	0	-/-
92	0	-	-	-	-	-	0	0	0	-	0	-/-
98	180	-	-	180	-	-	0	0	0	-	0	5/8
03	720	20	160	540	20	-	0	0	3	3	3	3/3
08	1720	-	260	1180	280	-	0	0	16	-	0	6/5
<b>Opuntia sp.</b>												
82	133	-	-	133	-	-	0	0	0	-	0	4/5
92	398	-	66	266	66	-	0	0	17	5	17	7/9
98	220	-	40	160	20	20	0	0	9	9	9	6/21
03	400	-	-	280	120	-	0	0	30	30	30	6/15
08	320	20	20	200	100	-	0	0	31	6	25	7/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
<b>Pachistima myrsinites</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	120	-	20	100	-	-	0	0	-	-	0	5/4
03	880	-	-	880	-	-	41	36	-	-	0	3/8
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Pinus edulis</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	80	40	60	20	-	-	0	0	-	-	0	-/-
03	40	20	20	20	-	-	0	0	-	-	0	-/-
08	80	40	60	20	-	-	0	0	-	-	0	-/-
<b>Purshia tridentata</b>												
82	0	-	-	-	-	-	0	0	-	-	0	-/-
92	0	-	-	-	-	-	0	0	-	-	0	-/-
98	120	-	40	80	-	-	0	0	-	-	0	-/-
03	0	-	-	-	-	-	0	0	-	-	0	-/-
08	0	-	-	-	-	-	0	0	-	-	0	-/-
<b>Quercus gambelii</b>												
82	599	-	-	599	-	-	0	100	0	-	0	12/5
92	133	133	133	-	-	-	0	0	0	-	0	-/-
98	480	120	360	100	20	20	0	0	4	-	0	59/61
03	60	820	60	-	-	-	0	0	0	-	0	16/14
08	740	-	740	-	-	-	3	0	0	-	3	-/-
<b>Symphoricarpos oreophilus</b>												
82	998	-	199	799	-	-	47	0	0	-	0	22/24
92	1398	399	599	666	133	-	5	38	10	-	0	20/26
98	1120	180	300	680	140	40	13	0	13	-	0	13/28
03	1100	100	280	800	20	60	4	13	2	2	2	13/28
08	1400	100	420	800	180	-	26	19	13	4	4	14/27